25X1

Central Intelligence Agency

Washington, D.C. 20505

DDI-01929/85

11 APR 1985

MEMORANDUM FOR: The Honorable Robert C. McFarlane
Assistant to the President
for National Security Affairs

SUBJECT: Structural Change [redacted] 25X1

1. I think you will be interested in the attached paper on the potential economic, social, and political effects of technological change. Although the paper represents the individual views of a senior analyst and not a formal CIA position, I believe that the implications are provocative and of sufficient importance to warrant your attention. [redacted] 25X1

2. Because the paper was originally intended for internal distribution only and therefore its content and style could create problems if it were quoted out of context, I am limiting its distribution to a very few high-level officials. I would appreciate any comments that you might have. [redacted] 25X1

/S/
William J. Casey
Director of Central Intelligence

Attachment:
Looking At Structural Change [redacted] 25X1
GI M-85-10093, April 1985, [redacted] 25X1

Distribution:
Orig. - Addressee w/att
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RD/OGI [redacted] (10 April 1985) 25X1

CONFIDENTIAL [redacted] 25X1

C-112

Central Intelligence Agency

Washington, D.C. 20505

MEMORANDUM FOR: The Honorable Malcolm Baldrige
The Secretary of Commerce

25X1 SUBJECT: Structural Change

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Central Intelligence Agency

Washington, D.C. 20505

MEMORANDUM FOR: The Honorable Caspar W. Weinberger
The Secretary of Defense

25X1 SUBJECT: Structural Change

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Central Intelligence Agency

Washington, D.C. 20505

MEMORANDUM FOR: The Honorable George P. Shultz
The Secretary of State

25X1 SUBJECT: Structural Change

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Central Intelligence Agency

Washington, D.C. 20505

DIRECTORATE OF INTELLIGENCE

9 April 1985

Looking At Structural Change

Scope Note

From time to time, the Directorate of Intelligence publishes essays or studies, which--although they reflect the viewpoint of a single analyst and not the coordinated position of the Directorate as a whole--are sufficiently insightful and provocative to warrant dissemination at high levels in the intelligence and policy communities. We believe that this essay will stimulate healthy debate and fruitful speculation about issues of great importance to the United States.

The essay charts the potential impact of technological change over the next several decades on the organization of production and employment and on the structure of society and politics. It further examines how these changes may be reflected in the status and power of individual nations in the industrialized West, the Communist Bloc, and the Third World.

GI M-85-10093

Looking At Structural Change

Introduction

At certain points in history, abrupt changes in the direction of a nation, a group of nations, or the world have been so profound as to name an era. Archeologists speak of the "Bronze Age" or the "Iron Age." Historians speak of the "Age of Discovery" or the "Industrial Revolution." In each of these cases, a new technology or complex of technologies--mining, smelting, navigation, the steam engine--went far beyond scientific or economic effects to force changes in social and political organization and the relative power of classes and nations. For example, according to some historians, the invention of the stirrup made knighthood--and European-style feudalism--possible; the invention of firearms made it an anachronism.

In recent centuries, these "structural changes" have accelerated. Technologies rise, flourish, decline, and are superseded within a few decades, and the changes forced upon societies and nations are equally rapid. Policy decisions made today in business or government may be played out under radically altered conditions. In these circumstances, the Intelligence Community has the duty to look beyond the pressing problems of the day to examine the dangers and opportunities of the decades to come. Analysts must learn to deal with mysteries rather than secrets--to see where the world is going despite as well as because of the intentions of the major players. Speculation becomes as important as collection.

In this paper, I will sketch out some trends that appear to be under way and assess how they may play out, first, in the organization of production and employment, and, second, in the structure of society and political life. Finally, I will point out how these changes may be reflected in the status of nations and the future of war. A study of the notably fallible predictions of past futurists makes me recognize that I will be wrong in many details and probably in some major trends. Nonetheless, I offer these speculations in the hope that they will act as a catalyst for more informed speculations by country and functional experts.

Seeds and Soil

Not all major technological changes "take" in the time and country of their invention. To use an analogy, technological innovations are like seed that, more often than not, fall upon the Biblical "barren ground." Only a few such innovations come at the right social and demographic time and place to develop into full-scale structural change. An often quoted example is

the invention of gunpowder, which did not create structural change in China, the country of its invention, until it was brought back in Western weapons centuries later. The invention of the wheel, which caused a revolution in transportation and warfare in the Fertile Crescent, was only a novelty in ancient Mexico where the lack of flat terrain and beasts of burden limited its application. To use still another example, in the 18th and early 19th centuries, labor-short America selected labor-saving agricultural technologies from the common bag of European ideas and inventions, while overcrowded Europe selected land-saving technologies. As innovation further increased the economic value of labor relative to land in America, the political and social system came to reflect this reality. In Europe, by contrast, technologies that enhanced the value of land reinforced a class system based on inherited land ownership.

In the following sections, I will emphasize the implications of technological innovations in terms of the "soil" upon which they are falling. I have neither the knowledge nor the space to make a detailed assessment of the "seeds" themselves.

The Structure of Production and Employment

Technological change is acting to both save labor and increase the potential labor force in a world where unemployment is already a serious problem. Almost every developed nation now considers as normal unemployment rates that would have been regarded as dangerously high a decade or so ago. Structural unemployment has increased in most of the major developing nations as well. On the one hand, robots and computers have eliminated some blue and white collar jobs and have the potential to eliminate many more. On the other hand, advances in medicine and public health, from heart transplants to gene splicing, continue to reduce death rates.

The Western industrialized nations have already experienced the transition from industrial to service economies. In all of these nations, services employ well over half the labor force. This does not mean that industrial production has declined. Indeed, just as agricultural production had its takeoff well after the shift of most of the labor force into industry, so industrial production has soared as industry's share of the labor force dropped. This trend will intensify, and the day will almost certainly come when industry and agriculture together will employ no more than 10 percent of the labor force in developed countries, with the remaining 90 percent in the increasingly heterogeneous category of services.

The initial effects of this shift can already be seen. The economic health and political clout of industrial regions in the Western countries are declining. Demands for protectionism and financial bailouts for dying industries are rising. The old "aristocracies of labor" have fallen, and labor unions are losing their power and their membership. A new "white-collar attitude"

of service employees is one element in the political shift to the right in many countries. At the same time, downward economic mobility is a reality for much of the population. Careers are ending in middle age, and the children of the working class are seeing their horizons narrowed.

Not all industries are declining. The high-tech industries are booming, but their prosperity lacks stability. Individuals, firms, and nations risk their position with each advance of the state of the art. Yesterday's breakthrough is canceled by today's discovery. One-time technological leaders such as West Germany appear to be tottering. Computer firms as well as steel mills shut their doors. Scientists and engineers as well as auto workers are driving cabs. The only difference is that the scientists and engineers have a better chance of again finding high-status jobs.

The large and growing services sector is composed of a small group of affluent professionals--ranging from movie stars and doctors to skilled repair men and computer programers--and a much larger group of deadend workers--ranging from street venders and garbagemen to teachers and nurses. Both groups are growing, but the less affluent group is probably growing more rapidly. Most people do not have the skills to become programers or master plumbers, much less doctors or professional athletes. Moreover, the failures and not-yet-successfuls of the more affluent group also form part of the second group. The struggling actor, the lawyer who can't pass the bar exam, the software designer whose creations don't fill the bill have incomes closer to those of janitors than to those of their professional colleagues.

This trend may well accelerate. The future of many high-status jobs is not assured. As more software specialists are trained--and their number is growing rapidly--as computers themselves become both more "user friendly" and more capable of doing work now done by human programers, the real wages and status of all but the best computer professionals are likely to fall. The trend has already begun in some of the other high-status services. In recent years, the average incomes of doctors and (especially) dentists in the United States have fallen because of breakthroughs in health care as well as increased numbers of professionals in the field.

The situation is even worse in the Third World. Many Third World economies have gone straight from agriculture to services without passing through an industrial phase of any importance. And, just as much of Third World agriculture is subsistence agriculture, many Third World services are "subsistence services" that have little economic purpose except to keep the worker alive. The services sector in the Third World is typified by: a girl sitting on a Guatemalan sidewalk with three oranges for sale; a neatly dressed Hindu offering to tell your fortune for 20 rupees; an Afrikaner bureaucrat studying unnecessary information on an unnecessary form before stamping it and passing it on to

another bureaucrat who repeats the process with a different stamp; a teenager passing through lines of stalled traffic on Avenida Reforma spewing burning gasoline from his mouth for the amusement and coins of the drivers.

There are a number of reasons why the Third World has turned to the service sector. First, agriculture doesn't hack it anymore. Commercial agriculture doesn't hack it, as the export prices of everything from sugar and coffee to peanuts and cotton continue to decline in real terms. Production for the home market is undermined not only by counterproductive government pricing policies but also by the competition of low-priced exports (and even gifts) from major food producers such as the United States. Subsistence agriculture doesn't hack it. Rapid population growth throughout the Third World is reflected in the subdivision of already inadequate plots and the further exhaustion of already overused land. Climatic change and desertification, caused in part by land pressures that result in over grazing, destruction of forests, and restriction of nomadic movements, add to the problem. Thus, farmers move to the cities. Abject poverty in the cities is better than starvation on the land.

Technological change in the developed countries has also undermined the market for nonagricultural raw materials. Real prices are falling for everything from copper and bauxite to oil and gold. Future technological innovations ranging from seabed mining to the use of ceramics in place of metals in automobile engines threaten to intensify this trend.

Parts of the Third World may profit from the export of First World pollution. The developed nations may establish steel mills, oil refineries, auto plants, and aluminum smelters in LDCs not so much to take advantage of cheap labor as to get around environmental concerns at home. (Another purpose will be to gain access to large internal markets in some LDCs.) Only those Third World nations with good infrastructures and relatively educated labor forces will be candidates for such industry. As most of these industries will be at least partially owned by Third World nationals, the true nature of this shift will not be widely recognized. There will be great jubilation when Brazil (or Mexico, or Korea, or China) becomes the world's largest automobile exporter, but this will not mean that the country in question has graduated from the Third World.

These Third World industrial plants, most of which will have some connection with developed country firms, are likely to be as capital-intensive as similar plants in the First World. Thus, they will do little to sop up unemployment. Moreover, the labor-intensive assembly industries that have been successful in many areas of the Third World are probably now on their way out. Robots may soon be able to assemble electronics and sew baseballs better and cheaper than even the lowest-paid Mexicans and Haitians.

The Communist World will also be hard hit by technological change. Much has been written about how the Soviet system, being based on secrecy, cannot survive the "information revolution." These fears (or hopes) may be exaggerated. I see the problems of the Soviet Union coming not so much from the elite or the system as from the broader culture (though, of course, both the system and the elite reflect the broader culture). The USSR--like the Russia of the Czars--is not so much rotten at the top as rotten all the way through! Indeed, the elite may be the best thing that Russia has going for it. The Russian elite has shown that it can build a hydrogen bomb or a space station, can develop new techniques of eye surgery, can make breakthroughs in pure science, and--not least--can hold together a varied and contradictory empire.

If the elite or the system were the problem, the answer would be simpler. Change the leadership; revise or overthrow the system! And history shows that this is not impossible. Russia has attempted major revolutions from the bottom (as in 1905 and 1917) and from the top (Peter the Great's westernization, the freeing of the serfs under Alexander II, and de-Stalinization under Krushchev). But whether from the bottom or the top, these revolutions have failed to change Russian culture.

Under Czar or Commissar, drunkenness, absenteeism, theft, and low productivity have characterized the Russian work force. Russia's peasants continue to be small-scale thinkers; if left to themselves, they could certainly produce a profit, but they would be highly unlikely to produce an agricultural surplus commensurate with Russian needs. Middle-class Russian emigres--full of admiration for freedom and market economics in the abstract--often find that they cannot cope with them in the reality of US, European, or Israeli society. Eventually, many recant and return home. Emigres from the elite--ballet dancers and scientists--are generally much better able to cope with life in the West.

Thus, the USSR seems destined to fall further and further behind as new technologies transform the Western World. No amount of state-of-the-art technology, either developed at home or bought or stolen from the West, will change that fact. And Russia will drag the rest of the Communist World down with it. More talented societies, such as East Germany, Hungary, and Czechoslovakia, would probably be able to make a niche for themselves in the new world if left alone. The Soviets, however, will have an even greater need than before for their resources and cannot afford to leave them alone.

The Structure of Society

The changes that technology forces in economics will eventually manifest themselves in the structure of society. In the Western industrialized nations, a trend toward increased social stratification will coexist uneasily with a trend toward

increased recognition of merit. As happened during the last major structural transition--from agriculture to industy--Robber Barons will arise (this time called entrepreneurs) who understand the new environment and profit by it, many huge corporations will prove as nonviable as the plantations of the post-Emancipation South, and "corporate responsibility" will seem as quaint a code as Confederate Chivalry. The entrepreneurs will be proud of having "made it all themselves" and firmly believe that they owe nothing to anyone. (Nonetheless, many will spend millions for public purposes they believe in, from ecology to modern dance.) Employees will be rewarded, often lavishly, on the basis of what they can do for the entrepreneur without regard for race, sex, age, or formal qualifications. There will be little sympathy for those who don't produce.

The new elite--the entrepreneurs, their employees, suppliers, and consultants--will probably constitute only about 20 percent of the labor force. Unlike the Industrial Age, which was based on labor and therefore could absorb the labor released from agriculture, the new age will be based on brains. The emphasis will be on particular people with particular talents and not on interchangeable workers or even interchangeable PhDs. The new technology will destroy more productive jobs than it creates.

This does not mean that the rest of the work force will be unemployed. No society or political system could withstand unemployment on such a scale. Many of the other members of the work force will be employed not so much in producing goods and services needed by the economy as in earning a living for themselves and their dependents. These workers will constitute the functional equivalent of the subsistence service sector that now exists in the Third World. They will, of course, have a better standard of living and greater self-esteem than their Third World counterparts, but their contribution will be almost as marginal. Some will work for (or manage) "old reliable firms" that have not yet gone under. Others will work at low-level jobs in elite firms--the kind of jobs that will be replaced by robots or computers as wages rise and the cost of technology comes down. Others will work foolproof "idiot-friendly" machines in medical centers, travel agencies, and government offices. Still others will be self-employed potters, furniture makers, gardeners, caterers, purveyers of singing and dancing birthday greetings, and the like. Some, not counted officially in the labor force, will make a good living at socially accepted illegal occupations.

Government, as in the Robber Baron era, will be the handmaiden of business--or at least elite business. There will be widespread agreement that the main function of government is to pave the way for technical innovation, trade, and production. Only in those (relatively few) countries where society is torn apart by the strains of increased social stratification will protection of property and maintenance of order be considered the primary government functions. As war

becomes increasingly unlikely (for reasons to be given below), the main function of the military will be to finance research and development of elite industries.

Social stratification is also likely to increase in the Third World. The elite will consist of workers and managers associated with smokestack industry exported from the developed countries, agriculturalists who have the training and capital to benefit from the second "Green Revolution" that is promised by biotechnology, and experts in communication, information, and finance who will be increasingly needed by both government and the national and international private sector.

Most of the traditional elite, except for those large landowners who are able to profit from biotechnology, will see their status eroded. Religious, political, and military leaders in particular may see their central position in national life contested by the new elite. The poor, as before, will be shifting out of subsistence agriculture into subsistence services. As the second Green Revolution progresses, small farmers will be forced off land put to more productive use. The encroaching desert will force out others. The flow to the cities will be intensified by the progressive elimination of the safety valve of emigration to developed countries, as robots take over more low-level jobs in First World services and agriculture. So-called second economies will continue to grow in crowded urban areas. While many of these enterprises will provide needed goods and services for the local population, only a very few will have the potential to grow into major industries. None is likely to become "locomotives of development," pulling national economies behind them. They will, however, help to dampen discontent with lack of opportunity in the formal economy.

The Communist countries will undoubtedly experiment with various top-down reforms, including at times increased reliance on market forces. Such reforms may increase the vigor of already existing second economies and raise the status of private entrepreneurs. Although in favorable cases these efforts may benefit living standards and reduce political discontent, they will do nothing to narrow the widening gap between the Communist nations and the post-industrial nations of the West.

Political Instability and the Structure of Politics

Increased social stratification and a decline in the availability of meaningful work will increase political strains throughout the world. Turmoil will rise, fear of mob violence will affect government policies in some countries, sabotage and vandalism will be one response of low-tech people in a high-tech world. Revolution, however, will remain a rarity. Most of the developed countries will have the resources to support the large part of the labor force engaged in quasi-subsistence services. Moreover, most of the workers in this sector will not realize that their contribution to the economy is marginal. Western

governments will generally support conservative economic policies, while social policies will alternate between libertarian permissiveness and neo-Victorian strictness. The Communist World will try economic and political liberalization in an effort to catch up with the West, but will restrict these policies from time to time as they threaten to get out of hand.

In the Third World, the social and economic problems will be greater and the resources to solve them will be fewer. Under these circumstances, some government leaders will move toward Communism. Even though these leaders will recognize that the Communist system has universally failed to provide economic growth, they will be more impressed with its successes in establishing effective police states. Other government leaders will be attracted by the more successful authoritarian states, such as Taiwan, Korea, Singapore, and Mexico. Few if any will be attracted to Western political systems.

Among the symptoms of political strain that I would expect to see in developed and developing nations and in the Communist World are nativistic, nationalistic, and millenarian movements, often of a religious nature. Such movements, which look back to a mythical golden age when traditions were honored, people were virtuous, and the foreigners and/or the machines were not a threat, usually are associated with periods of structural change. Examples from previous transitions from agricultural to industrial societies include the Luddite and "radical" Protestant movements in England as well as the Know-Nothings, the Ku Klux Klan, and the Ghost Dance rebels in the United States.

In the developed nations of the West, these movements are likely to be less extreme than in other areas. Although organizations such as the West German Green Party may gain public notice--and give some solace to those who believe that the world is going to the dogs--they are unlikely to prevail. The new elites, depending as they do on science and technology, cannot afford to let antirational groups gain control of government or education.

These movements are more likely to be effective in Third World societies. Khomeini's Islamic Revolution is an obvious example, and it is not hard to conceive of fundamentalist or heretical Islamic movements taking over in other Middle Eastern or African nations. In Mexico, Indian villagers have rioted for the restoration of the Latin Mass, and in Brazil African-based cults are attracting all races. In the future, priests, politicians, and other members of the traditional elite who have lost status may seek to use such popular religious and national movements to restore their prestige and redress the balance against the new industrial elite associated with foreign interests. They probably will be successful in some countries.

In the Communist world, Russian nostalgic movements may center on Orthodox Christianity or Islam, while Eastern Europe may develop its own version of the West German Green movement. Another possibility would be a movement harking back to the "purer" Communism of Stalin (or Lenin or Marx). If Communist ruling circles appeared to be moving toward liberalization and market economics, many low-level functionaries and Party has-beens might find such a movement appealing. Even if they were not able to regain power or status, their passive resistance could be effective in slowing reform. Something like this may be happening in Communist China at present.

The Status of Nations

There appears to be a consensus among futurists that Europe will quickly fall behind in the high-technology race, leaving the United States and Japan to battle it out for world economic leadership. These writers speculate that, within Europe, France, one or more of the Scandinavian countries, and perhaps Italy will be better able to adapt to the new environment than countries such as Germany and the United Kingdom. The argument is that, throughout Europe but especially in Germany and the UK, social and political factors will prevent the organization of the well educated and responsible (if no longer very industrious) work force and management to move into the postindustrial era.

This may well be the case. However, in a brain-intensive era, it seems unlikely that the entrepreneurs of Japan and the United States would willingly forgo the intellectual resources of the European elite work force. I suspect that we will begin to see a number of multinational high-tech firms, whose "leading" nationality is difficult to determine. For example, a firm might be based on US technology and Japanese capital, with plants in France, Germany, and Ireland, an international management and technical staff, and customers throughout the Eastern Hemisphere. In other words, the Americans and the Japanese will organize elite sectors of the European economy in a way that the Europeans themselves cannot do for historical, social, and political reasons. Moreover, this will be done in such a way as to downplay the non-European hand.

Similar nationality-hiding arrangements may defuse the leadership battle between Japan and the United States. Elite sectors of the two economies need each other, and government may eventually have to go along. If Tokyo continues to rack up huge trade surpluses with the United States and the rest of the world, it will eventually face a wave of protectionism that could destroy the Japanese economy. Japan is not set up to maintain its economy on the basis of its domestic market, and the Japanese have no counterthreat that would be effective against a wide-spread boycott of Japanese goods. The boycott would not even have to be organized or coordinated; the individual nations would take such actions quite naturally to preserve their trade balances. Many of the Japanese elite must realize this.

If leadership position and national status become ambiguous among developed nations in the postindustrial world, they will be increasingly emphasized in the Third World. Within the Third World, a sharp line will be drawn between those 15 to 20 nations that have something to offer the postindustrial world and the rest. Among the also-rans of the Third World, countries will be ranked by such criteria as political stability and ability to feed the population. Most of these countries will have fewer economic contacts with the developed world than at present, as their manufactures will not be competitive and their mineral and agricultural products will be in only spasmodic demand. Some countries may achieve a harsh autarky like that of Paraguay in the early 19th century. Others, less lucky, will depend upon continuing international aid to avert famine.

The status of the Communist nations will continue to fall. The failures of their economic systems will be recognized far and wide, as Eastern Bloc living standards slip behind those of the more prosperous LDCs. Marxist economics and sociology--though still entrenched in some Third World (and First World) universities--will slowly fall to the status of flat-earth geography. On the other hand, the Marxist police state will achieve new popularity as a model for sorely beset Third World governments, and countries that would never consider importing a Soviet truck or lathe will eagerly import East German intelligence experts and Cuban presidential guards.

The Future of War

World War II may have been the last modern war. The wars fought since 1945 have all been less than state-of-the-art, if only because nuclear weapons were not used. In the future, this could be true for reasons other than fear of mutual destruction. Military research in the major nations has outstripped the capacity of these nations' military establishments to put new weapons systems into place. Given the time required for decision, purchase, testing, training, and deployment, most systems are 20 years behind what is technically possible by the time they are integrated into national armed forces. By the year 2000, US and Soviet weapons in place may lag the possible by 30 or 40 years. The other developed countries will be even farther behind. Under these circumstances, military establishments East and West will never believe that they are ready to fight a war. They will always need more time and a larger share of the budget. So, unless some crazy civilian has the clout to override all the military--which is not very likely--we will have seen our last modern war.

In a situation where Western governments' debts are running well over 40 percent of GNP (68 percent in Japan and 85 percent in Italy), cost is also a consideration. The military even in developed countries already has weapons systems that are too expensive for use in training. Thus, the men who may have to use them have had no realistic experience of their potential or

pecularities. The generals will certainly want to save such costly weapons for an emergency and not waste them in a war! Poorer countries will be even less able to finance a hi-tech war. It's doubtful if either Argentina or the United Kingdom would be eager for a rematch in the Falklands/Malvinas for just these reasons. Nor would Iran and Iraq be so quick to fight it out. Nor would Israel have invaded Lebanon, if it had had to absorb the financial costs itself.

Preparing realistically for a state-of-the-art war may also present opportunity costs that no nation can afford. The kind of technicians needed to get the most out of tomorrow's weapons systems are the kind that will be in short supply in the elite economy. Diverting these men and women to the armed forces could seriously undermine a nation's economic health. Moreover, a draft would have to be instated that would suck up PhDs with hot prospects and shun high school graduates needing work. It would be economic suicide for any nation to remain on such a footing over a long period.

Even if modern war has priced itself out of the market, war itself will continue. Low-tech wars may even increase in popularity. It will be most cost effective to let the formal military establishments continue to play at preparation for the "Big One" (that will never come) and use surrogates for the real business of projecting political power.

Caveats and Questions

The speculative scenarios presented above, like most futurist predictions, are based on the continuation and intensification of present trends. History shows, however, that trends often change and even reverse themselves. Oil gluts turn into oil shortages and back into oil gluts, pulling economic arrangements and political power in their wake. Thus, as I stated earlier, my projections are likely to be far off the mark in some important areas. With an eye toward anticipating changes of trend, the analyst might want to consider the following questions:

-- What likely developments in technology could greatly increase the value of certain raw materials--like oil in the early 1970s--and how would this affect the relative power and prosperity of individual nations?

All of my speculations in this paper have been based on the assumption that real prices of all important agricultural and mineral resources would continue to fall. If this is not true, then my gloomy outlook for most LDCs is off the mark. For example, if for whatever reason the price of copper were to consistently outpace the world inflation rate--as the price of oil did in the 1970s--then

Chile and Zambia and a few other countries would have much brighter futures.

No one I have talked to expects this to happen during the next couple of decades. Copper, tin, cobalt, bauxite, iron, coal, uranium, wheat, corn, coffee, sugar, cotton--whatever the product the experts see little prospect for sustained price revival. There is some chance that oil or gold could again soar in the 1990s, but even these commodities are unlikely to reach past highs in real terms.

Water is perhaps the commodity most likely to increase in real value. Countries that control the headwaters of major river systems have an obvious source of power over downstream nations. Moreover, the application of existing technology might allow some countries to "steal clouds," that is, divert rain from where it would naturally fall to their own agricultural areas. The rising cost of water could also force the development of exotic conservation, desalinization, and transportation (iceberg towing?) techniques.

-- The Japanese have achieved much of their success by making correct guesses about future economic and technological trends and by establishing a national effort to take advantage of those trends. What would happen if Tokyo were to guess wrong and force Japan down a mistaken economic path?

In my scenario, I have assumed that Japan would continue to be a model of economic success. There is no guarantee that this will be the case. Japan, steadily pressed to give up "mature" industries to rising countries such as South Korea and Singapore, must stay ahead of the technology curve to have a viable economy. This implies making major commitments of resources on the basis of early and imperfect knowledge. A mistaken direction, followed with zeal, could set Japan back by years.

-- Can the USSR and the United States continue to afford the cost of supporting strategically important but economically weak allies such as Cuba, Nicaragua, Israel, and Egypt?

The short answer to this question is yes. Both the USSR and the United States have the resources to support their major allies for the indefinite future. In this paper, I have assumed that such allies would become even more valuable, because of a perceived trend among the great powers to project

political power through surrogates rather than through formal military establishments.

The long answer, however, may well be no. If, as I believe is most likely, the Third World were to lose economic importance for both superpowers, countries such as Egypt and Nicaragua would lose much of their strategic importance. Under these circumstances, policymakers would be less likely to subsidize living standards in Havana or Tel Aviv at the cost of living standards in Odessa or Kansas City.

The Soviets are already taking steps in this direction. In their relationships with such important clients as Ethiopia, Mozambique, Angola, and Nicaragua, they are supplying military but not economic needs. They are in effect saying, "We will protect your security, but your prosperity is your own concern."

-- Could some miracle of biotechnology allow Africa to feed itself, despite its political and demographic and ecological problems?

In this paper, I have assumed that much of Sub-Saharan Africa was beyond agricultural redemption. This seems to be the reluctant consensus of most of the experts who have studied the problem. One can hope, nevertheless, that some technical innovation--like the invention of the steel plow which almost overnight transformed thousands of square miles of American prairie into potential wheatfields--will give Africa and Africans another chance.

-- What developments could once more raise the value of unskilled manpower?

My speculations were based on the assumption that robots and other machines would soon be able to perform most unskilled work in factories and farms at a lower cost than low-wage workers. Although unskilled labor would continue to be employed in subsistence services or otherwise supported--this would be a political necessity--its contribution to the economy would be minimal.

No one I have talked to was able to come up with a plausible economic use for unskilled labor, except possibly as cannon fodder in low-intensity, low-tech warfare. I may be overlooking some factor--I hope that I am--but I see no way out of this dilemma.

-- What developments could greatly reduce the time gap between research breakthroughs and the integration of new weapons systems? Are these developments likely to occur in one country alone?

My scenario for the future of war assumes an increasing time lag between the initial design and the final deployment of weapons systems. During World War II, the P-38 went from design to deployment in a couple of years; the adoption of Stealth has already taken a decade and may take more. This reflects not only increasing technical complication, but also financial constraints and delays built into the democratic process that were not operative during World War II.

Aspects of this trend could be reversed by advances in computer application. Sophisticated computer simulations could obviate the need for trial-and-error development and testing. Moreover, in a crisis situation, financial and political constraints could probably be overcome. It seems probable that a technologically advanced, highly disciplined nation like Japan would be in a better position to reduce the time lag (given the desire to do so) than either the United States or the USSR.

-- Can a large nation (such as the USSR), if given the proper incentives, change its culture in a short time period?

The gloomy prospects for the Soviet Union presented in this paper hinge upon the immutability of Russian culture. By and large history shows that national cultures change only with great slowness. The one partial exception is Japan after World War II. I seriously doubt that Russia has the same potential.

-- Is there a future for low-tech, high-impact warfare, perhaps biological? Could this make certain smaller nations the military equals of the USSR and the United States?

The answers appear to be yes and no. It is easy to conceive of a situation where, for example, Libya might be able to neutralize a far more powerful Egypt through the clandestine introduction of biological agents into the water supplies of Cairo, Alexandria, and some military bases. Given the amounts of biological material needed, such action would not come close to eliminating the populations of these urban areas. It might be

enough, however, to throw the Egyptian Government and military establishment into chaos and allow a foreign army to march in. Much would depend on how long the Libyan hand could remain hidden.

Such an attack would almost certainly fail against a larger, more dispersed population. It would not allow Mexico to defeat the United States, Argentina to defeat Brazil, Pakistan to defeat India, or China to defeat Russia. Against such large targets, biology could become a weapon of terrorism but not of war.

-- Could biotechnology make the USSR self-sufficient in grains, despite the Russian culture?

If we believe that this is possible (though just barely) for Sub-Saharan Africa, it should certainly be possible for the Soviet Union. Although such a development remains highly unlikely, if it were to happen it would do much to restore the fading luster of the Communist state around the world. Perhaps more than any other development, it would give the USSR a degree of economic power to match its political and military power.

-- Is it possible that a growing number of LDCs will have nothing--not resources, not labor, not markets, not strategic location--that the developed countries want? Would such countries fall into a kind of stagnant isolation?

In this paper, I have argued that this would indeed be the case. Under this scenario, only some 15 to 20 advanced LDCs would have anything to offer the developed world. The rest would decline into a kind of primitive subsistence. Economies would turn inward. Population growth would slow because of increasing mortality. Urbanization would be reversed. Tribal zero-sum games would become the order of the day. Some states would resemble Kampuchea under the Khmer Rouge, while others--the luckier ones--would resemble the Paraguay of Dr. Francia. Contact with the developed world would largely be limited to tourists, anthropologists, and aid officials.

What could keep this from coming about? Apart from a biotechnological revolution that transformed Africa into the breadbasket of the world, the only possibility I see is the continuing missionary spirit of Communists and Democrats alike. In a situation where neither the East nor the West has

anything to gain in military or economic terms, an idealistic zeal to spread Communism and Democracy to all mankind might still entail a network of political and economic contacts.

-- Is it possible that population expansion of non-Slavic peoples in the USSR will prove a benefit rather than a liability to the Soviet system?

To my knowledge, no one has examined this question. The assumption has been that any expansion of the less-educated, less-urbanized peoples of southern and eastern Russia at the expense of the Slavic majority could only serve to weaken the Soviet system. This is probably true. A scenario can be conceived, however, under which an expansion of non-Slavic peoples forces the USSR into ethnic, if not political, pluralism. Such a multiethnic state might have considerable appeal to foreigners--Chinese, Turks, Iranians, Afghans--now alienated by Slavic nationalism. At the very least, a truly multiethnic state should reduce tensions inside Russia that currently constitute a weakness in the Soviet state.

-- Which nations will be the economic superpowers of 2085? Why?

Although it is impossible to answer this question, it is vital to think about it.

In 1985 the economic superpowers are clearly the United States and Japan, and their power is based on superior ability to make technological breakthroughs and to carry these innovations into the marketplace. The runner-up powers are largely limited to Western Europe. In 1885 the economic superpowers were the United Kingdom and France, and their power was based on the possession of huge overseas empires. The United States, its agrarian aristocracy crushed by a victorious industrial class in the Civil War, and Germany, newly united under Prussia, were coming up fast. Japan and Russia were also rising as military and political, if not economic, powers. The Austrian and Turkish Empires, though rapidly decaying, still had the appearance of power.

In 2085, geographic size may be less important for the postindustrial economies than it was for the industrial and agricultural economies of the past. In this regard, the small advanced economies of the Far East may lead the way, while the Canadas, Australias, and Brazils may find their size to be

more of a disadvantage than advantage. In fact, the developed countries of the next century may really be segments of countries--the Washington-Boston corridor, the Dallas-Austin-Houston triangle, California, and equivalent areas elsewhere in the world. If this is true, then there would be no true economic equivalents of Japan and the United States. Fifty or so advanced urban clusters around the world would take the place of the economic superpowers of the past.